

The Mining Journal

London, September 6, 1957

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Vol. 249 No. 6368

Established 1835

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Published each Friday by

THE MINING JOURNAL LTD.

Directors

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G. A. Baliol Scott R. A. Ellefsen

**15, WILSON STREET,
LONDON, E.C.2.**

Telegraphic Tutwork London *Telephone* MONArch 2567 (3 lines)

Annual Subscription £2 10s. Single copy ninepence

Colombia Goes Nap On Mining

IN May this year the president of Colombia, Sr. Rojas Pinilla, was overthrown and his government was replaced by a military junta of five, under whom there is a Cabinet consisting for the most part of civilians.

The new government soon became aware of the seriousness of the country's financial situation. The total foreign exchange debt was found to be U.S. \$401,000,000 instead of the figure of U.S. \$280,000,000 quoted by the previous Finance Minister, Sr. Morales Gomez. Immediate action was accordingly taken to close the exchange control office for the grant of import licences while the financial policy was revised. This policy has now begun to take clear shape. It might be summarized briefly as increased austerity, vigorous counter measures against inflation, the settlement of the commercial debt on equitable terms, and the restoration of Colombian credit abroad.

So far there are only vague indications of the form that the austerity campaign will take. Government expenditure will be cut by some 25 per cent; import licences will be limited almost entirely to raw materials for existing industries; and foreign exchange will not be permitted for the establishment of new industries or for assembly plants.

The Exports Credits Guarantee Department, it will be recalled, recently suspended new business with Colombia. This action was taken to limit the department's liabilities in the Colombian market in view of the substantial exchange delays and the unsettled outlook. It is hoped, however, that the new foreign exchange system will lead to an improvement in conditions which may permit an early resumption of cover.

It is noteworthy that a mission of the International Monetary Fund, which recently visited Colombia, was greatly impressed by the responsible approach of the new government to economic problems. The I.M.F. has allowed Colombia to draw \$25,000,000 to assist in meeting the acute shortage of foreign exchange.

The utmost importance is clearly attached by the present government to the more intensive exploitation of mineral resources as an essential step towards the attainment of a more balanced economy. Earlier this month special privileges were granted to the mining industry by decree. Henceforth all base minerals may be exported freely without paying export taxes and without any obligation to return to the country any of the dollars earned from exports. Such dollars may, however, be sold on the free market.

This regulation has been issued for a period of 30 years and puts the mining industry on an equal footing with the petroleum industry. At the present time the minerals mainly affected are coal, limestone and sulphur. Efforts were made by the previous government to increase the export of coal, of which large deposits exist. The Japanese were reported to have offered to buy coal from the field in Valle del Cauca and also to have offered financial help for the development of this coalfield, on similar lines to the assistance already being provided by a German concern at Cerrejon.

The concessions should also encourage prospecting for other minerals and the development of known deposits. Interest has lately been reported in the potentialities of various occurrences. The St.

Joseph Lead Co. has set up a Colombian subsidiary for the operation of a concession granted in Cundinamarca. It hopes that sufficient lead will be produced to allow an exportable surplus after satisfying Colombia's needs. The intention is to refine lead locally. The Richmond Petroleum Co. has a licence to explore and exploit nickel deposits in the Department of Cordoba. In January this year a representative of the U.S. Atomic Energy Commission visited the area of Santander, where uranium deposits have been reported.

A special statute will be drafted for the precious metal industry. All gold, silver and platinum will, in future, be sold to the Banco de la Republica, which will thus become the sole exporter. Banco de la Republica will pay the miners in dollars. Other details of the arrangements are not yet known. Last year Colombia produced 437,607 troy oz. of gold and 109,260 oz. of silver. Production of both metals has lately been declining, the gold and silver outputs in April, 1957, amounting respectively to 20,696 oz. and 7,298 oz.

Oil production in 1956 at 6,200,000 tonnes was nearly 10 per cent higher than in the previous year. The largest producer is Shell, followed by Ecopetrol, Texas and Colpet.

While it appears that at present the emphasis is on the expansion of exports rather than the processing of minerals, the Finance Minister has announced that a body will be formed to study and decide upon the technical and economic desirability of establishing new industries.

An American concern is reported to be studying the question of building a plant for the production of aluminium ingots at Cartagena from imported bauxite. United States interests were asked by the former Government for technical assistance in developing the Paz del Rio Steelworks with a view to trebling its present production of 100,000 tons by 1959. Cement production is in the region of 100,000 tons a month.

BREAKING THE BOTTLENECKS

Producers and exporters of base minerals have long been tantalized by the existence of a sellers' market which could not be fully exploited on account of acute transport bottlenecks and congested ports. It so happened that the scramble for minerals precipitated by the Korean War came at a time when many countries were critically affected by the world-wide shortage of rolling stock, which in both Southern Rhodesia and the Union of South Africa was aggravated by the rapid tempo of internal development.

Transportwise, the tide has at last begun to turn. A progressive increase in export railings has been reported from various countries and this trend may be expected to continue.

In the Central African Federation, the traffic carried by the Rhodesian railways during the year ended March 31, 1957, rose by 11 per cent in comparison with the previous year, to reach a record total of 10,800,000 tons. For the first time since the war, the railways came near to meeting public demand. The amount of coal and coke at Wankie went up by 9.7 per cent to 3,600,000 tons, while 102,000 tons were carried from other collieries. Apart from coal, 2,600,000 tons of minerals were carried—an increase of 10.4 per cent. The records for chrome, copper, zinc, lithium, asbestos, and limestone, were all broken. In the case of chrome ore, exports increased by 45 per cent to 713,000 tons.

In May this year it was reported that railage of chrome ore had reached 80,000 tons a month, production being between 50,000 and 60,000 tons a month. Stockpiles of

chrome in the Colony, it was stated, had been reduced from more than 400,000 tons in April last year to an estimated 130,000 tons, and it was anticipated that they would be cleared in about six months. As from July this year, the Chrome Truck Allocation Committee has been in a position—for the first time since 1953—to give small truck allocations to ten new producers.

The improved truck allocation position in the Federation has been achieved as the result of heavy importations of rolling stock, a substantial amount of which has been loaned by Anglo American, mostly through the Anglo American Rhodesian Development Corporation.

South African exporters of manganese ore are still experiencing considerable difficulty in obtaining sufficient rail transport. Due to an erratic truck allocation, exporters are often unable to ship their ore to meet contractual delivery dates. In a competitive world market, it is very necessary to maintain a tight delivery schedule, particularly in the light of growing competition in the United States from Brazilian ores. The rail bottleneck appears to be in the Kimberley area of the Free State; hence the doubling of the Natal line from Durban to Ladysmith, expected to be completed within twelve months, is not seen as a solution to the manganese ore trade's transport problems.

Mr. J. F. T. Naude, the South African Minister of Finance, said recently that South Africa was seeking a £10,000,000 loan to develop her railways. "The Union", he stated, "has been developing very rapidly and needs some outside capital to improve her harbours and develop her railways to transport her metals out of the country. Over the next five years, we contemplate spending something like £60,000,000 on rail transportation and harbours." Mr. Naude hopes to raise the £10,000,000 in Washington, but not necessarily from the World Bank.

Included in a £5,824,000 harbour development project, which has been approved by Parliament, is a £2,487,000 plan to make Port Elizabeth the Union's main manganese ore-exporting port. The scheme provides for two new manganese berths and a manganese store with a capacity of 250,000 tons of ore. In about three years' time, when the manganese facilities are completed, the port will be able to handle 700 tons of ore an hour.

Expansion now being carried out at the two southern Turkish ports of Mersin and Iskenderun will greatly facilitate shipments of Turkish chrome ore. When the work is completed Mersin will be able to handle 4,000,000 tons of all types of goods a year and Iskenderun 1,000,000 tons. In 1956 these ports handled 500,000 tons and 100,000 tons respectively.

After modernization it is expected that at least 70,000 tons of chrome ore a year from Pozanti in the Taurus Mountains will be exported from Mersin. Meanwhile, three jetties are being constructed at Iskenderun, one of which will be for chrome shipments.

Mineral exporters may also expect to benefit from the comprehensive programme of railway expansion with which Turkey will go to the Railway Conference starting in Baghdad on November 11. Funds for ambitious extensions are being provided partly by United States aid and partly by money allocated under the Eisenhower doctrine. In addition, the Turkish Railway Administration plans to modernize the existing network and replace steam traction by electrical and diesel locomotives. Altogether, ten years are envisaged for the scheme to be completed and a total sum of 2,000,000,000 Turkish pounds will be required.

India's manganese industry continues to be hampered by a severe wagon shortage and on some lines the volume of traffic has also been restricted by the railways' improvement and doubling programmes. Not only is the carrying capacity of the railways too limited, but the ports lack the

facilities to transfer ore exports smoothly and steadily on to ships. Nevertheless, the directors of Central Provinces Manganese Ore Co. were able to report that railings for the half year ended June 30 last were better than for the corresponding period of 1956.

In Ghana, the railway system is in progress of modernization, the harbour capacity of the country has been extended, and a new port is under construction at Tema, 17 miles east of Accra.

BEATING THE SUN

Mining companies operating in hot and arid regions may benefit from a process devised by Australian scientists, who believe that they have perfected a method of combating evaporation.

The city of Broken Hill is served by two reservoirs and a pipeline from the Darling River at Menindee, 80 miles away. The Stephen's Creek reservoir has a capacity of 4,616,000,000 gallons and a catchment area of about 200 sq. miles. Umberumberka has a capacity of 2,196,000,000 gallons with a catchment of 150 sq. miles.

Ever since the days when Broken Hill had to rely on waterholes filled by infrequent rains, the problem of maintaining an adequate supply has been aggravated by the rapidity with which stored water is evaporated by the sun.

A 14-week test made by the C.S.I.R.O. at Broken Hill has reduced evaporation by 37 per cent. The experiment, it was claimed, saved more than 200,000,000 gallons of water in the city's reservoir at Stephen's Creek, equivalent to six weeks' consumption at Broken Hill.

The process uses beads of an insoluble chemical, hexadecanol, which floats on the surface of the water. A special raft anchored in the centre of the dam prevents the hexadecanol from floating away. A thin invisible film of hexadecanol spreads from the beads and restricts evaporation. Should the film break, additional hexadecanol is supplied by the beads.

The C.S.I.R.O. and the Broken Hill Water Board began these experiments in December, 1955, and the final results will be awaited with interest. Assuming that the process is economic and that it could be successfully applied in other parts of the world where water rapidly evaporates from storage dams, this simple method of prevention might well be attractive to mining companies. In the Orange Free State, for example, the gold mines are drawing about 40,000,000 gallons of pure water daily from the Vaal River. This drain, which is placing a heavy strain on the source of supply, might perhaps be appreciably eased if the rate of evaporation could be reduced.

CANADA'S VAST IRON ORE RESERVES

Sufficient exploration has taken place in Canada to indicate very clearly that Canadian resources of iron ore are tremendous, according to the Department of Mines and Technical Surveys.

Not only does Canada possess large reserves of direct-shipping iron ore, but also vast resources of low-grade iron-bearing material of concentrating grade. Iron formation, for instance, extends in an almost continuous belt from 150 miles north of the Gulf of St. Lawrence to the northerly tip of the west coast of Ungava Bay. The quantities of low-grade iron-bearing material of concentrating grade contained in this belt can be measured in terms of billions of tons (giving the word billion its American value, 1,000,000,000). It is meaningless to place an arithmetic figure on the actual amount of iron material present be-

cause the figure would amount to little more than a guess based principally on visual estimates supported by a relatively small amount of diamond drilling. And these are not the only deposits of low-grade iron in Canada. There are a number of large deposits of low-grade iron in Ontario, each one of which can be measured in many millions of tons.

Even the deposits of direct-shipping iron ore, currently being mined in the vicinity of Schefferville, Quebec, and Steep Rock, Ontario, contain at least a billion long tons of iron ore. At the moment, all that is drilled off and calculated mathematically amounts to about three-quarters of a billion long tons, but no one who knows these deposits believes that this is the total amount of ore present.

At Wabana, Newfoundland, it is virtually impossible to calculate accurately the amount of ore contained in these large submarine deposits. Estimates have ranged all the way from four billion tons to 10 billion tons. At the current rate of production, these deposits, which have already been mined for nearly sixty years, will last for another 840 to 2,400 years, depending on which estimate one chooses to select and assuming an anticipated extraction rate of 60 per cent.

What shortages of iron ore that there are in this continent are regional shortages only, such as exist in the Pacific coast of Canada. There is no absolute shortage of iron ore either in Canada or on this continent as a whole. There is, in fact, an absolute abundance sufficient to supply both our domestic and export market for generations to come.

THAILAND'S NEW MINING BILL

The Government of Thailand has drafted a bill to bring the 37-year-old mining act up to date, because land rents and fees charged under it are "too low".

The new law is intended to give the Government greater control over the survey, mining and sale of ore and provide more effective protection for mineral resources, as well as mineworkers. It will authorize the Minister of Industry to establish a Mining Department Office in any district where there are large mineral resources.

A survey permit may be granted for an area not exceeding 3,000 rai (one rai is 400 sq. yd.), and for a period not exceeding one year. A concession may be granted for not more than 25 years.

SOUTH AFRICAN COAL PROSPECTS

Speaking at the opening of a new coal-preparation pilot plant in Pretoria, the Minister of Economic Affairs stated recently that the estimated reserves of bituminous coal in South Africa were 70,000 million tons. Whilst present coal production in the Union is only 36 million tons per year, reserves appear to be highly satisfactory, but the Minister warned against extravagant exploitation of coal resources bearing in mind that coal cannot be considered solely as a solid fuel. Prospects of finding natural gas and petroleum in South Africa are dim, so that coal in future years will be called upon to supply the need for these fuels and also to provide chemical raw materials. Energy from coal might in future be replaced to some extent by nuclear energy, but South Africa expected to base any substantial indigenous production of liquid and gaseous fuels on coal. Consequently, said the Minister, it was essential to the country's future prosperity to maintain a vigorous and healthy coal industry. At present, production of coal is increasing at the rate of 2.5 per cent per annum, but this rate could be substantially increased by the producing mines if required. An expansion of the coal export trade might soon be possible as part of the coal industry's development.

THE conveyance and handling of water and gases in large mining and metallurgical enterprises located in outlandish areas has seen a number of improvements of recent years. At the outset, what might be considered a somewhat primitive method of utilizing wooden pipe-lines, has of more recent date been raised to a high standard for supplying water-power installations at low cost. It is claimed that production costs are usually from 30 to 40 per cent below the cost of good steel pipes of corresponding dimensions. Even when used for storage power plants, the great security against freezing permits them to be laid above ground, while the great elasticity of wood affords resistance to small ground movements which must always be reckoned with in mountainous areas when the pipe cannot be fastened direct to the rock and which might exert influence at the supports.

Other advantages are the complete indifference of the wooden walls to corrosive water, which likewise applies in handling many corrosive solutions in the process, and

Pipes for

Conveying Water, Liquors

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the low frictional loss which is some 20 per cent less than that of steel pipes. The easy means of forming curvature makes for favourable hydraulic efficiency. Scope for rotting agents is no longer afforded when the wooden pipeline is permanently and sufficiently saturated with water, and which influences only such wood as contains between 20 and 55 per cent moisture. The insertion of compensators is rendered superfluous, since changes in temperature only make for insignificant deformation, while the pipes are light to handle.

The machine-banded form of pipes is constructed for pipes of 2 to 20 in. dia., and the continuous form for 20 in. up to 13 ft., while the largest diameters are 16 ft. One of those lines installed for one installation is 1,640 ft. in length, 71 in. in dia., and operated at a pressure of 21 lb. p.s.i.¹ Machine-banded pipes up to 20 ft. in length suffice for smaller installations, and are built up from selected boards, accurately machined, wound spirally with wire on the outside, asphalted, juted and again asphalted. This is in order that the wire reinforcement is protected against the attack of moisture from the ground and the air.

By C. C. Downie

Individual pipe sections are connected with forced-on wooden collars, using larchwood, or specially creosoted woods, as the collars are not permanently and sufficiently saturated with water. In view of accurately milling the pipes on the outside and the collars on the inside, a reliable water-tight joint is produced by the mere forcing of the pipe into the collar. An entirely different form of construction is used for the continuous pipes, where only the component parts are manufactured at the works, des-

patched in the dismantled state, and permit space in ships and railway wagons to be fully utilized.

The selected boards are milled on all four sides, and the edges are equipped with tongue and groove, planed accurately radial, and the inner and outer surfaces are planed to the correct circumferential form, after which the pipe-staves are assembled at the construction site in the actual pipe track. Templates are used with tension hoops screwed with nuts and clamping shoes, using steel containing 0.3 per cent copper, which is claimed to give the metal from 50 to 70 per cent lengthier service. Tongues are made wider than the staves by 0.04 in., and ensure a sound joint, while a tar-free bitumen protective compound is finally applied. Where the pipe-line remains permanently under a pressure of at least 20 to 26 ft. head, internal coating is unnecessary, but creosoted wood is desirable at low pressures.

Although wood-stave pipes are intended for low or medium pressures, they can be built for pressures up to 215 lb. p.s.i., some up to 260 lb. p.s.i., but generally are used at from 100 to 115 lb. p.s.i. With large diameters from 10 to 13 ft., pressures should be under 60 to 70 lb. p.s.i.

With diameters up to 59 in., wood-stave pipe-lines are generally laid underground, supported on wooden saddles,

And Gases

using care in filling the trench. With lines of larger diameters, these are mounted on saddles above ground, spaced not more than 10 ft. apart, while with pipes more than 6½ ft. in dia., the saddles should reach up to about the horizontal diameter.²

Developments in steel pipes for the same purposes are seen in water-gas lap-welded units made from special pipe plates of good welding properties, possessing an elongation of 20 per cent and tensile strength ranging from 24 to 30 tons p.s.i. After welding, this elongation is appreciably increased by annealing, while the welded seam is guaranteed at a tensile strength of not less than 20 tons p.s.i. The overlapping designs have been the subject of numerous patents. Wall thicknesses range from 0.2 to 3½ in. with pipes varying from 1 to 10 ft. in dia. Only two kinds of pipe joints were formerly used, namely, the bell-and-spigot joint and the flange joint, whereas to-day, for each of the three types of pipe-lines, a variety of special joints is available.

Some authorities still prefer the leaded bell joint, because in caulking, the rust-protective coat in the interior is left undamaged, but the heat generated in welding destroys it and renders restoration more difficult, particularly with smaller pipes. Where the pipes are used for conveying producer or other gas, small leaks are frequently more dangerous than pipe fractures.

Some pipes have shallow grooves turned on the outside, and reinforced by seamless rings of material of higher tensile strength, which are then shrunk-on. This permits economies where a greater strength is required with walls which cannot exceed a normal 3 in. thickness.³ In the mat-

ter of joints for high-pressure lines, an exhaustive list of patented welded designs has followed the original plain bell weld joint, and the latter with expansion fold and welt.

These include safety bell weld joints with or without expansion fold, the same with double-border, and also with additional lengthy spigot, spherical bell weld joints, double-wall and double-back-fold joints, which are too elaborate to describe in short detail, and which also incorporate similar measures in tank construction. Encouragement has been given towards reducing the number of joints in such pipes by improved systems of welding, due to the fact that sections of practically any length of pipe can be turned out. It is claimed that by dint of experience with the more specialized joints, which incorporate a variety of folds and relieved welds, gas leakages are literally impossible, and such joints differ materially from those with centering necks and flanged sockets, etc., which suffice for high-pressure water activities.⁴

For pressure work, improvements have been made in the production of seamless steel tubes, following methods originally instituted by M. Roeckner, and piercing the bloom in Pilger mill equipment. Wall thicknesses are made from $\frac{1}{2}$ in. upwards to meet pressure requirements, while hollow bodies up to 40 ft. in length and 6 ft. in dia. are formed from the one piece. The lighter units have already seen use in decomposition towers for dealing with nickel carbonyl, and even non-pressure towers which formerly were more slowly constructed from refractory materials.

While there is not the same demand for pressure-resistance, the acquisition of the large section in one piece is claimed to save time in erection but, of course, has to compete with the welding system. For dealing with moderately corrosive liquors, rolled tubes of copper-nickel steel have also been turned out using this form of radial rolling mill. The earlier Pilger mill equipment, which sufficed for normal wall thicknesses of about $\frac{1}{2}$ in., has been replaced by more modern plant. Incidentally, not a few of the large concerns engaged on smelting waste brass materials have recently installed extensive cooling tower arrangements, similar to those of the regular ore smelters where the rolled tube with closed-end holds advantages.

Corrugated tubes are only required for special purposes, but have also been used for bubble-plate condensers, and all of which are produced from the same plant.⁵

Oxygen Supplies, Pipe-Cleaners and Copper Pipes

A useful auxiliary in the erection of pipe-lines and tanks is the portable oxygen generator, similar in a sense to the acetylene generator, particularly in the more primitive areas, where no cylinders of oxygen and acetylene are available. Shipping and land transport costs are materially reduced where generators for both gases are on hand for immediate use. Oxygal, which originally provided the oxygen, has since been replaced by other materials which produce a greater volume of the gas per unit weight, while calcium carbide is handled in the usual way. Even with the former, however, 1 lb. could produce $4\frac{1}{2}$ cu. ft. of oxygen gas at a pressure of 210 lb. p.s.i.

Where repairs have to be performed by welding, this portable generator is mounted on a trailer for supplying 5,300 cu. ft. of oxygen at a purity greater than 99 per cent,

and at a pressure suitable for welding needs. This corresponds to the equivalent of 25 steel cylinders, where the dead weight of each cylinder approximates to 0.6 lb. per cu. ft. of oxygen available, i.e. before further improvements were made in the oxygen-producing powders used. The pressure available in the generator suffices for cutting material up to 4 in. in thickness, and in order that continuous operation can be maintained at all times, two retorts are provided for the reception of the powders. The equipment includes a reducing valve for adjustments of the pressure, filter for removal of any mechanical impurities contained in the gas and gauges, etc. The powders are retained in hermetically sealed sheet-steel drums and may be stored for indefinite periods and, together with calcium carbide, afford the means of welding at any location. Thus the most difficult territories are opened up to the use of autogenous welding, quite apart from long-distance pipe repair and maintenance.⁶

Cleaning Pipe Lines

For the purpose of cleaning out pipe-lines of various types, and to remove the deposit of mineral matter, etc., a specialized form of equipment has been introduced. The actual designs differ according to the type of pipe, the nature of the incrustations, and the power available for operating the cutter-head. This rotary cutter-head with its cutting elements, is rotated by the pressure of the water flowing through the pipe, which serves to propel the tool, and installed within the interior of which is a small turbine. Regulation of the speed of propulsion is done by a rope attached to the rear of the tool, and where sharp bends have to be cleaned out, a shorter model is substituted.

For very hard, thick incrustations, the turbine-driven models are built for pipe-lines of from 3 to 39 in. in dia. With the larger diameters, however, in place of a rotary cutter-head, the front-end is fitted with a number of scraping cutters, disposed around the periphery.

In connection with copper pipes, which have been used to a limited extent in wet metallurgical practice for linking up to evaporator plant and vacuum pans, etc., their various physical characteristics have been the subject of extensive researches. Resistance to corrosion and mechanical stresses, high tensile strength, elasticity, fatigue strength and elongation, are points in favour of their use. Compared to lead pipes, the high tensile strength of copper permits a smaller wall thickness, better heat transmission, and pipes which are indifferent to water-hammer due to their elasticity. Copper pipes may be bent cold, and without filling even around a small radius, with diameters up to 14 in., besides bends of other pipe diameters without elbows or fittings which are essential for iron pipes. Specialized spread connections and clamping connections have been developed and improved methods of brazing.⁷

Regarding pipe-lines for handling compressed gases such as chlorine, phosgene, ammonia, etc., it might not be amiss to refer to an improved fine-regulation valve where the seat is of a plastic which is chemically inert and non-hygroscopic, thereby forestalling deformation. For certain gases and hard operating conditions, a special alloy replaces the plastic. Several designs are available with fixed or exchangeable screw cap, or for flange connection with bores ranging up to 4 in., with arrangements for fitting pressure gauges or meters for indicating the contents of the container.⁸

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The Boris Kidric plant at
Lukavac in Bosnia

BEFORE the Second World War, the coal industry in Yugoslavia was poorly developed. Total production of all kinds of coal in 1939 was only 7,000,000 tons, whilst in the period 1929 to 1939 the annual increase in coal production was no greater than 0.6 per cent. During the same period, national coal consumption exceeded production by 200,000 to 250,000 tons.

Demand for coke was satisfied entirely by imports. Further, in the War of Liberation, many coal mines were

cent. Relatively large coal reserves exist in Yugoslavia although their composition is unfavourable for exploitation because of the low calorific value of the lignite content.

The chief coal industries exist in Serbia and Bosnia. The prospecting work and reconstruction carried out since the war has resulted in a considerable increase in coal production, in 1948 output amounting to 10,664,000 tons, in 1952 12,980,000 tons, in 1954 13,663,000 tons and in 1956 17,101,000 tons. The greatest increase was in the output

The Coal Mining

622-333 (494.1)

ruined, some shafts were flooded and many installations destroyed, with the result that coal production was restricted. Immediately after the war, however, reconstruction of the coal mines was begun, as was extensive prospecting. The result of these activities was that in 1946 Yugoslavia's total production of coal was 6,652,000 tons. New coal deposits were discovered in Serbia, Bosnia, Croatia and Slovenia.

Known coal deposits in the country are estimated to contain 21 billion tons. Of this total, bituminous coal accounts for 1 per cent, brown coal 9 per cent and lignite 90 per

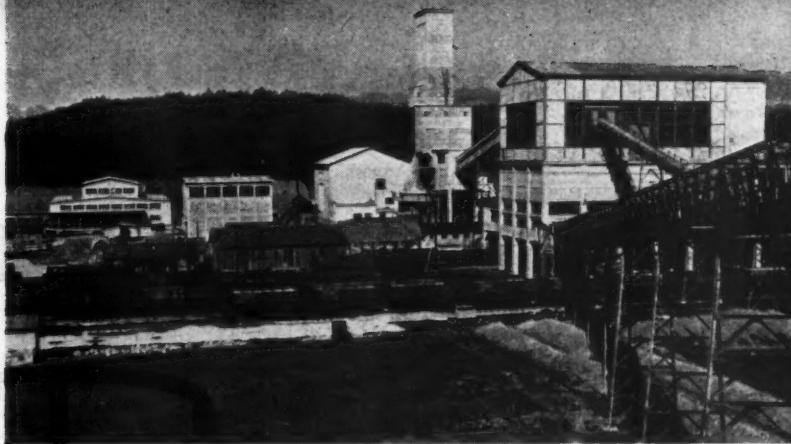
cent of lignite which in 1946 amounted to 2,072,000 tons and rose to 4,247,000 tons in 1952 and 7,427,000 tons in 1956. Increase in brown coal production was also very marked, rising from 3,832,000 tons in 1946 to 8,442,000 tons in 1956. Output of bituminous coal also has increased rapidly, in 1956 amounting to 1,232,000 tons.

This increase in lignite production was made possible by the exploitation of beds of high-grade coal and by favourable conditions of extraction, since the chief collieries can be described as large tonnage operations where coal is won by opencast methods. Indeed, in 1956, ap-



The largest bituminous coal
mine in Yugoslavia is at
Rosa, in Croatia

The lignite mine at Velenje,
Slovenia



proximately 15 per cent of Yugoslavia's coal production was exploited from opencast mines, although this percentage is still considered as too low. When newer mines, now under construction, reach the production stage, opencast output will rise to about 20 per cent or more of the national total.

It is estimated that in 1957 Yugoslavia's coal production will total approximately 18,500,000 tons. This output will be the result of earlier investments in the industry which have averaged 8 billion dinars a year, of increased

the country imported high-quality coal for coke production. After the war, however, the coke plants in Lukovac and Zenica were built and established themselves as the base of the Yugoslav coke industry. In 1952 coke production amounted to 150,250 tons rising to 404,130 tons in 1954 and 923,000 tons in 1956. It is estimated that coke production will be more than 1,000,000 tons this year.

Owing to the difficulties in procuring coking coal on foreign markets and to the increases in price demanded by foreign sellers, Yugoslavia's coke plants have been pro-

Industry of Yugoslavia

efficiency in the mines and the raising of productivity, as well as of more widespread use of mechanization and the introduction of new methods. In the near future, when new mines start production, total output of Yugoslav collieries will be increased to approximately 21,000,000 tons. At this output Yugoslavia's coal reserves will allow for 1,000 years of exploitation.

In the past Yugoslavia has not exported appreciable tonnages of coal owing to the low calorific value of the coal produced. During the last few years annual exports averaged approximately 150,000 tons whilst simultaneously

By Branko Djukic

cessing increasingly greater tonnages of domestic coal. Industrial tests so far completed show that coke for steel production can be produced from a mixture of 40 per cent domestic and 60 per cent foreign coals.

Yugoslav coal and coke output, small though it is in comparison with that of other more highly industrialized countries, nevertheless may be viewed optimistically when the potentials of the industry are considered.

The largest brown coal mine
in Yugoslavia is at Banovici,
Bosnia



MOLYBDENUM-II

Mining and Usage of Molybdenum

METHODS of mining molybdenum depend largely on the type of deposit. In porphyry-type deposits large-scale caving methods are employed, but in vein-type deposits cut-and-fill stoping is preferred.

The mine of the Climax Molybdenum Co., at Climax, Colo., with a 30,000-ton-of-ore-per-day record in 1955, is considered the largest underground mine in North America. Situated at an elevation of more than 11,000 ft., the plant includes mine, mill and a complete townsite.

The shape of the ore zone is irregular in three dimensions. In plan on the upper levels it was shaped like a doughnut, with the quartz rock in the centre; but on the lower levels, where the volume of quartz rock is less and more Climax porphyry is exposed, the ore zone loses its regularity. On all levels the area of ore is most impressive. The ore contains small values of tungsten, pyrite and tin, which are regarded as reserves.

Mining operations have progressed from the Leal level at 12,145 ft. elevation downward to the White level at 11,940 ft., the Phillipson level at 11,470 ft., and the Storke level at 11,170 ft.

The original shrinkage-stope mining method produced up to 1,500 tons per day. Later, additional ore was recovered from the pillars by large-scale blasting. Small coyote drifts and powder tees were driven in the pillars for emplacement of the explosives. The collapse of pillars and subsequent drawings of the ore from them indicated the feasibility of caving the ore.

The Climax system of caving is perhaps best characterized by the method of drawing ore from the caved area. Originally, the caved ore was drawn through finger raises on to grizzlies and transfer (or storage) chutes to the cars. Problems were encountered in using this method in ventilation, safety, communications, handling of men and materials and maintenance. A slusher system of loading was gradually evolved, whereby the ore is brought directly into slusher drifters and loaded into cars by scrapers. This method has proved very successful.

Production Capacity

Molybdenum production capacity is governed by the grade of headfeed and capacity of the milling and flotation sections. The grade of ore mined can be varied within wide limits by selective mining. The company now blends ore from the two mine levels to obtain a uniform headfeed. In 1956 the rougher circuit of the mill consisted of 15 separate units with a combined ore capacity of 32,000 tons per day. Another unit with a rated capacity of 4,000 tons per day was expected to come into operation early in 1957.

In actual practice the rated mill capacity can be varied rather widely, depending on the fineness of the grind. A much larger ore tonnage could be milled daily by coarser grinding, the total amount of molybdenum recovered per day being thus increased, but the result would be a decrease in overall recovery of the molybdenum content per ton of ore. This practice was followed during World War II, along with selective mining of higher grade ore, and the company materially increased its molybdenum output dur-

An article in a previous issue described world resources of molybdenum. The concluding instalment appearing herewith discusses the mining methods employed by the Climax Molybdenum Co. and the uses for which molybdenum is employed. All aspects of the molybdenum industry are covered in a comprehensive survey issued by the U.S. Department of the Interior entitled, *Molybdenum, A Material Survey*, for sale only by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price 75 c.

ing that period. However, such a practice has obvious disadvantages.

Finer grinding of the ore would probably increase the overall molybdenum recovery and might permit utilization of ore not now considered of commercial grade. This flexibility permits the company to adjust its molybdenum output up or down by perhaps several million pounds annually in response to demand.

Usages

An estimated 85 to 90 per cent of all molybdenum consumed in recent years was used in ferrous alloys; the remainder was consumed in metallic form, in non-ferrous alloys and in non-metallurgical uses.

The alloying effects of molybdenum in steel are derived both from its effect in solid solution in ferrite and from its effect in the carbide phase.

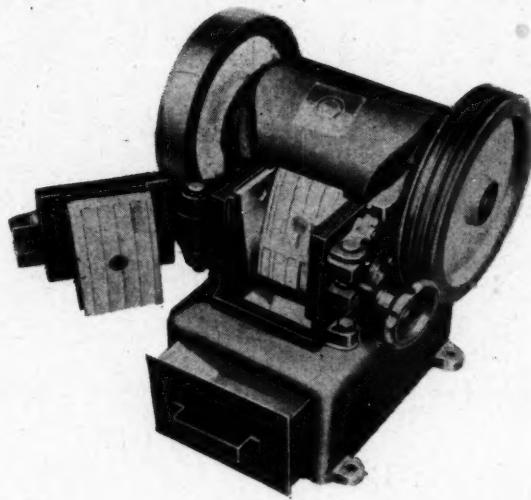
Many construction alloy steels used in the hardened or hardened and tempered condition contain about 0.10 to 0.50 per cent molybdenum for its contribution to hardenability. Larger amounts of molybdenum promote secondary hardening and are used in some steels where this effect is desired. Molybdenum is a most effective alloying element for increasing the strength and creep resistance of both low- and high-alloy steels at high temperatures. In quantities up to about 0.5 per cent, it is used extensively to combat embrittlement in certain steels that are either tempered in the temperature range from about 850 deg. F. to 1,100 deg. F., or are subjected to stresses and strains during service at such temperatures.

It is estimated that about 15 per cent of the current consumption of molybdenum is in cast iron.

Molybdenum's high melting point, good high-temperature creep properties and availability, have made this metal one of the most promising materials for developing heat-resistant and structural alloys capable of supporting useful loads at temperatures above 1,600 deg. F.

Although molybdenum-base alloys have latterly been the subject of considerable research and progress has been made in developing protective coatings, they have not as yet been commercially produced for applications in air at high temperatures. Consequently, the major use of molybdenum in non-ferrous and special alloys is restricted to relatively low percentages.

Molybdenum reagents are employed in a wide variety of laboratory analyses and tests. Molybdenum compounds are used in the ceramic industry and its catalysts are employed in various applications.



Head Wrightson Colliery Engineering Ltd., a subsidiary of Head Wrightson & Co. Ltd., announce that work has been completed on an improved design of centrifuge of special interest to the coking and gas-making industry.

The centrifuge occupies a space of approximately 6-ft. cube and the gear assemblies are made of special alloy steel with heavy duty ball and roller bearings. The parts are fully protected against contamination by materials being treated and special attention has been paid to facilities for easy renewal of mesh plates and ready access to internal working parts. Automatically controlled lubrication gives a continual flow of oil to all working parts.

This equipment is designed to decrease the free moisture contained in various materials of comparatively small size by the use of centrifugal force and the moisture contained in washed small coal and slurry can be reduced to between 6-7 per cent. The capacity of the standard size varies from 50 to 80 tons per hour and a power absorbed is approximately 45 h.p.

RELIEF VALVES FOR LIQUIDS

A range of new relief valves, designed specifically for handling liquids, is being introduced by Megator Pumps & Compressors Ltd. The design is claimed to be an advance on any other liquid relief valve on the market.

The valves, which are made of high quality bronze to BSS 1400-LG3, were originally developed for use with Megator pumps, to protect the installation against excessive discharge pressure or faulty operation, but they are now available also to industry generally.

A particular feature of the valve is the introduction of a skirt to the clack, which makes the valve more positive and stable in operation. As soon as the valve begins to open the skirt presents a greater area to take the pressure, so providing an increasing force to overcome the increasing resistance of the spring as the valve lifts. There is, therefore, a smaller differential between the opening pressure, the pressure at which the valve will continuously discharge full capacity and the reseating pressure.

Among other unusual features of the valve are an arrangement to render more difficult any unauthorized interference

Machinery and Equipment

Improved Design of Centrifuge

fabricated from a special aluminium alloy, all crushing, wearing surfaces are of chrome stellite. The eccentric movement, sited at the top of the moving jaw, is enclosed in a sealed oil bath. This siting allows for a constant discharge opening which ensures a uniform product and eliminates the need for regrinding the crushed product.

The fixed jaw is fitted to a hinged door which opens outwards, enabling easy access for cleaning down after a sample has been crushed. A further feature is the tightly fitting drawer into which the crushed product is discharged, a measure incorporated to eliminate loss of sample through escape of dust. Jaw setting is effected by a hand wheel control.

The units are produced in two sizes. The No. 1 size has a jaw opening of $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. and requires $\frac{1}{2}$ to 1 h.p. to run at 450 r.p.m. Capacity of this unit is 250 lb. of granite per hour, the bench space occupied being $14\frac{1}{2}$ in. by 22 in. The No. 2 unit has a jaw opening of $4\frac{1}{2}$ by $3\frac{1}{2}$ in. and requires 1-2 h.p. at a speed of 400 r.p.m. Bench space required is 18 by 29 in.

Both units may be arranged for belt drive with fast and loose pulleys or may be motor-driven with V-belt drive.

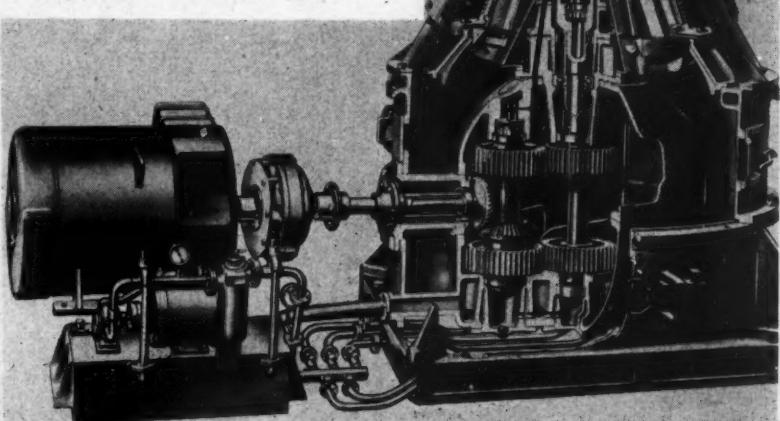
BRITAIN'S LARGEST TYRE

The largest tyre ever made in Britain—7 ft. 5 in. high—has been produced from a special mould at the Dunlop factory. Designed for heavy earth-moving machines, it costs £800, weighs a ton, and contains 300 miles of nylon cord.

LABORATORY JAW CRUSHERS

In the design of their new laboratory jaw crushers, Knapp and Bates Ltd., have paid particular attention to producing maximum strength with the lightest possible construction.

To this end, whilst the frame is



MINING MISCELLANY

During May the Orinoco Mining Co., Venezuela, reached a record output of 1,000,000 tons.

The Ontario Department of Mines is placing eleven geological parties in the field this year.

A decree has been passed in Venezuela whereby unclaimed deposits of bauxite and manganese are considered to be "national reserves," i.e., State property.

Prospecting operations for nickel deposits are reported to have been undertaken in Pali district, India, by the State mining department.

Rio Canadian Exploration, the exploration branch of Rio Tinto, has optioned twenty mining claims in the Wintering Lake area of Northern Manitoba from Cold Lake Mines. Aerial exploration will be undertaken.

The Eti-Bank's prospecting team operating near the Ergani (Eastern Anatolia) copper mine has found a new copper ore deposit estimated to contain some 360,000 tons. The Ergani mine itself is believed to contain 100,000 tons.

A survey of iron ore deposits is being planned by the Office of the Economic Co-ordinator (O.E.C.) and the Korean Office of Geological Survey. It is likely to be financed with I.C.A. funds and will probably include an aerial survey.

A report on the Republic of Honduras for the period January-June, 1957, refers to a surge of interest in oil, gold, silver and iron ore in the south and eastern parts of the country and bauxite in the north and east. In particular, several important groups have shown interest in the well-known Agalteca iron deposits.

At the invitation of the Department of Mines of the Republic of Honduras, Paringa Mining and Exploration Co., Ltd., have sent a technical member of their board to investigate various mining possibilities in that country.

The United States concern, Keller and Co., through its Chilean representative, Mr. Fleischmann, has undertaken to invest \$U.S.500,000 in Compania Minera Sociedad Muanillos Y Batuco, which operates copper mines in Manton de Luna, in the province of Aconcagua.

Deposits of titaniferous minerals being prospected in the Port Herald district of Nyasaland show considerable promise, states the annual report of the Director of Geological Survey. There seems to be every chance that these deposits will furnish an important addition to Nyasaland's export trade in the near future.

It is reported from Canada that Sturgeon River Mines Co. is to suspend mining operations at its Rocky Brook Mill Stream property in New Brunswick

owing to low base metal prices and the lack of interest in shares of development companies. The company plans to conserve cash and retain mine assets until the return of favourable conditions.

It has been announced that a large number of applications has been received for permission to prospect for various types of ore in the Spanish mining districts of Almeria, Badajoz, Caceres, La Coruna, Lugo, Oranze and Pontevedra. The list includes 57 requests for iron ore prospecting, four for copper, four for lead, 21 for wolfram, 17 for tin, and one for gold.

Mount Isa has started the first of the large engineering projects in its five-year expansion programme. This is the construction of the largest electrical winder in Australia. When completed in November, this unit will lift some 180,000 tons of ore per month from the mine—an increase of 80,000 tons.

Two new deposits of pyrochlore have been found in the Southern Province of Nyasaland by the Geological Survey Department. There are now four known deposits of pyrochlore in the territory, all in the Southern Province. Further investigations will have to be carried out to assess whether the pyrochlore is present in sufficient quantities to be of real economic importance.

Vertical shafts are being sunk with the help of powerful machines in the Lvov-Volyn coalfields in the Ukraine. The same machines place pig-iron tubing in position in the shafts. Each machine has 70 motors with a total capacity of 2,500 kW. Manufactured at the Urals Heavy Machine-Building Works, the machines can sink shafts with a diameter of 4 ft.

A survey of lead and zinc deposits in County Armagh was recently begun by a team of geologists from London as part of a project to reopen disused mines in the area. The survey was requested by the County Committee of Agriculture and was commissioned by the Northern Ireland Ministry of Commerce. It is expected to be completed within three months.

During August, the Northern Nigeria minesfield joint industrial council held a two-day meeting at Jos, centre of the Region's tin and columbite mining area. Following discussions, sub-committees of the council were set up to investigate service conditions. Presiding at the meeting was the Waziri of Bornu, Shettima Kashim, chairman of the industrial council of the minesfield.

A prediction that the Philippines will become the principal copper-producing country of the Far East, and that her output of this metal will more than double in the next five years, is contained in a report recently issued by the former chief of the mining division of the United States Foreign Operations Mission in Manila. The expert, Mr. Earl Irving, said

that present production had reached around 30,000 tons of copper contained in 125,000 to 150,000 tons of concentrate.

Important expansion work is now in progress at the Bor and Majdanpek copper mines and works in Serbia. It is anticipated that the extensions will be completed by 1961-62. By then, Majdanpek will have doubled its output of metallic copper and copper concentrates, raised its output of selenium by 200 per cent, and taken up the production of a number of other by-products. Total costs are put at \$58,000,000, of which \$40,000,000 are said to be assured already by credits from France and Belgium.

In April and May this year, a team of Chinese, Japanese and American experts surveyed coalmines in the Nanchang and Hsinchu areas of Formosa. The Japanese members of the team had been sent by the Yawata, Fuji and Steel Tube companies, who were considering investing capital in the development of the coal resources in these two areas. However, the team's final report put the resources of the two fields much lower than the original rather optimistic estimates, and it now seems unlikely that the Chinese-Japanese-American enterprise, which it was thought at one time might be set up for their exploitation, will, in fact, materialize.

At a meeting of mineral sands producers from New South Wales and Queensland, held recently in Brisbane, it was decided to form the "Australian Association of Mineral Sands Producers" to deal with matters and problems affecting the industry as a whole. Mr. D. G. Cummins, of Associated Minerals Consolidated, Ltd., was elected president. The two vice-presidents are Mr. J. F. Miller, of Zircon Rutile, Ltd., and Mr. A. T. George, of Heavy Minerals Pty. Ltd.

A £53,000 plant for the treatment of sulphur from pyrite concentrates has been completed at North Fremantle. Concentrates from the Gold Mines of Kalgoorlie Ltd. at Kalgoorlie, containing a small amount of gold are to be roasted for the production of sulphuric acid, and the gold recovered from the calcine. The plant will treat 40,000 tons of pyrite concentrates annually. This is part of a State-backed move to produce the raw materials of sulphuric acid in Australia, rather than pay £250,000 a year for sulphur imported from the U.S. and Mexico.

A large coal deposit stretching for over 300 km. has been reported as discovered in the Dnieper steppes of the Ukraine. The new coal area, called the Western Donbas, is already under development. The first two mines of the new coalfield are to be completely mechanized and each is expected to produce up to 1,000,000 tons of coal annually. Altogether 20 mines are planned to be built in the new Western Donbas, according to Tass. The new coal area's proximity to the large iron and steel

works of Dniepropetrovsk, Dneprodzerzhinsk and Krivol Rog will help the further development of the Ukrainian heavy industries. The coal of the new coalfield is suitable for coking. Large deposits of lignite had also been found on the western bank of the Dnieper in its middle reaches. Five open-cast mines with an annual capacity of 3,000,000 to 6,000,000 tons are now under construction.

PERSONAL

We regret to report the death of R. S. G. Scott, chairman, Siamese Tin Syndicate.

Mr. R. J. Harbord, a son of Mr. Vernon Harbord, will be joining the firm of Riley, Harbord and Law, as from October 1 this year.

Mr. Paul Ambrose Jousse has been appointed a director of Falcon Mines, Ltd., in the place of Mr. Francis Eric Wigley, deceased. Mr. C. F. Osmond, a director of the company, died on August 10, 1957.

Pursuant to the reorganization of the Central Mining/Rand Mines group in South Africa, Mr. W. M. Frames, chairman of Rand Mines, Ltd., has retired from the boards of the Central Mining and Investment Corporation, Ltd., and Central Mining Finance, Ltd.

Mr. E. N. Lowe, senior export executive of the B.T.R. group of companies, engineers in rubber and the thermoplastic materials, will be leaving the United Kingdom on September 8 for a coast-to-coast business tour of Canada. The objective is to expand the group's business, particularly in relation to its wide variety of products for the mining industry.

Mr. C. G. Simpson, O.B.E., has been appointed director-general of staff, and Mr. J. V. Wood, director-general of industrial relations, National Coal Board. Mr. Simpson succeeds Mr. J. O. Blair-Cunynghame, O.B.E., recently appointed a member of the Board, and Mr. Wood will succeed Mr. A. Walsh, M.B.E., who is to become deputy-chairman of the South-Western Division.

Mr. K. C. Acutt has been appointed deputy chairman of Rhodesian Anglo American, Ltd., of which Sir Ernest Oppenheimer is chairman. He has also been appointed deputy chairman of the following other Rhodesian companies in the Anglo American Corporation group: Bancroft Mines, Ltd., Nchanga Consolidated Copper Mines, Ltd., Rhodesia Copper Refineries, Ltd., Rhokana Corporation, Ltd., and the Rhodesia Broken Hill Development Co., Ltd.

The following delegates to the Mining and Metallurgical Congress at Vancouver will be flying Canadian Pacific Airlines Polar route from Amsterdam to Vancouver: Mr. W. G. T. Pyne-Mercier, senior technical mining adviser, Government of South Africa, and Mrs. Pyne-Mercier; Mr. D. R. Love, manager, Dominion Division, Metro-Vickers Electrical; Mr. E. F. Elcan, technical director of Powell Duffryn; Mr. G. N. S. Leader, director, Bewick, Moreing and Co.; Mr.

G. E. Pearse and Mr. E. S. T. Edwards of Imperial Chemical Industries.

COMPANY EVENTS

As from Monday, September 9, the address of the Export Licensing Branch of the Board of Trade will be Gavrelle House, 14 Bunhill Row, London, E.C.1.

The Solartron Electronic Group Ltd. has decided to sell no longer through agents in the U.K. In future, all enquiries should be sent direct to the group at Thames Ditton, Surrey.

Despite the centralization of the Marshall-Fowler sales organization, industrial retail sales will continue to be handled through the organization's concessionaires for the U.K., Thos. W. Ward Ltd.

New offices and stores for the British Thomson-Houston Co. Central Africa (Pvt.) Ltd. are due to be opened in Bulawayo during October or November, 1957.

An International Products Division, with world-wide representation, has been formed by Thermotank, Ltd. (Helen Street, Glasgow), to handle the sales and distribution to the trade of various products concerned with air conditioning, heating and ventilating.

In his annual statement, the chairman of Sheepbridge Engineering, Ltd., Mr. A. V. Nicolle, said that arrangements had been made with Gebr. Eickhoff Maschinenfabrik u. Eisengiesserei, m.b.H., of Bochum, Germany, for producing a type of pan conveyor for the coal-mining industry.

AB Fagersta Bruk has purchased a rock-drilling factory in Vancouver, British Columbia, and intends to introduce its products on the Canadian market. In addition to its own production at Fagersta, this Swedish company also manufactures rock drills in South Africa and Mexico.

Last week, for the first time, nitroglycerine was made in a plant that is completely remote-controlled. At 4.10 on Tuesday afternoon, August 27, after preliminary testing, nitration was started in the Ardeer No. 5 (Biazz) Hill plant of I.C.I. After operating successfully from late February, 1956, until July, 1957, the plant had been closed for the installation of remote control, together with the necessary television equipment. The process vessels are observed by two TV cameras. What the cameras see is relayed by closed circuit to the remote-control room, and reproduced on two small TV screen installed on the main instrument panel. The remote control centre is also linked to the nitration room by microphones and an intercommunication system, enabling the sounds of operation to be heard.

EXHIBITIONS AND CONFERENCES

The Dublin meeting of the British Association for the Advancement of Science will be held September 4-11, 1957.

An international Congress and Exhibition of Measuring Instrumentation and

Automation (INTERKAMA) will be held in Düsseldorf from November 2-10, 1957.

"Guard Your Hands" is the slogan for this year's National Industrial Safety Week in the U.K., which will be held from September 30 to October 5.

In view of the interest created by the course on Non-Destructive Testing organized by the British Council in 1956, a second course will be held in 1958 from February 9 to 22. Membership of this course is limited to people from overseas.

The opening meeting of the 13th annual session of the North-Western Fuel Luncheon Club will be on September 25, 1957.

A symposium on alkali metals is to be held at the 133rd National Meeting of the American Chemical Society, scheduled for San Francisco in April next year. The chairman will be Mr. Marshall Sittig, president and managing director of the American Lithium Institute.

Eighteen U.S. metal scientists have been appointed as moderators of the international panels that will feature the scientific deliberations of the second World Metallurgical Congress convening in Chicago from November 2-8 this year under the sponsorship of the American Society for Metals.

The Parliamentary Secretary to the Ministry of Works, Mr. Harmer Nicholls, M.P., has accepted an invitation to open the Corrosion Exhibition in London on October 15. Enquiries concerning the activities of National Anti-Corrosion Week may be sent to the organizers at Stratford House, Eden Street, London, N.W.1.

CONTRACTS AND TENDERS

The Purchasing Division of the London Field Office of the General Services Administration, at present situated at Keysign House, 429 Oxford Street, London, will be closed from September 15, 1957. In future, all purchases made by G.S.A. on behalf of the International Co-operation Administration will be made by its Washington office. Firms now registered with the London office of G.S.A. will continue to receive tenders direct from Washington, but contracts not yet completed will continue to be administered by the London office. Any enquiries on tenders or for literature should be sent to National Buying Division, Federal Supply Service, General Services Administration, Room 7109-B, 7th and D Streets, S.W., Washington 25, D.C.

Formosa

Project Implementation Order No. 84-21-007-9-70381 (Invitation No. US-284D) calls for mining machinery and equipment comprising air compressor, haulage type mine hoist, six rock-drilling machines, centrifugal fan, three pneumatic sump pumps, compressed-air hose, water hose, hose couplings, etc., and equipment for rock drills. Bids should be sent to Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan (Formosa). Closing date: October 1, 1957.

Metals and Minerals

The U.S. Tungsten Probe

Throughout the past decade the U.S. has been the largest purchaser of tungsten ores and concentrates. Last year imports amounted to 10,928 s.tons of contained tungsten, which compares with 10,394 tons in 1955, a peak of 14,565 tons in 1953, and an average of 4,198 tons in the period 1947-51. Last year's imports came from no fewer than 23 countries distributed throughout all five continents.

It is thus evident that U.S. buying policy during the years ahead cannot fail to have a significant impact on world markets for tungsten ores. Unfortunately the outlook is obscured by the prolonged conflict between a Government anxious to assist the domestic tungsten industry and a Congress unwilling to grant the necessary funds. Finality is unlikely to be reached for some considerable time and the ultimate outcome of the present struggle is anybody's guess.

Tungsten became very vital during the Korean war and the U.S. embarked on a programme to buy it overseas and expand output at home. When the need for tungsten fell off with the end of hostilities, the Federal Government continued its domestic purchasing programme for two more years to help U.S. mines adjust themselves to new market conditions. This year Congress refused to appropriate any more money for this purpose. Last year domestic production amounted to 7,380 s.tons.

At a recent Senate enquiry, Mr. John G. Leipert, special assistant to the Assistant Secretary of the Interior, whose speciality is mineral resources, said that an "artificial world market" had been created in recent years as a result of U.S. purchases of tungsten for stockpiling, and that the suspension of this programme had left a large surplus of tungsten overhanging the world market. He expressed the view that it would be some time before the world market could find its proper level.

Due to the disparity in world and domestic prices and the end of the Government purchase programme, almost all domestic tungsten mines are now closed down. Even if all tungsten imports were barred, domestic capacity would still outpace consumption and cutbacks would be required. The Administration therefore wishes to help U.S. tungsten producers through continued subsidy buying until they can "shrink" their own activities. The problem is complicated by the fact that the Government is still buying under contract about \$50,000,000 worth of foreign-produced tungsten under Defence Production Act agreements made in 1951 and 1952.

The possibility of increasing the present duty of \$7.90 per unit ton has been under consideration, but Mr. Liebert stated in evidence that duties would have to be raised by 400 per cent to put the U.S. producers in a competitive position. The Interior Department is studying ways of increasing U.S. consumption of the metal, but so far has not come up with any specific answer to the problem. In

1956, consumption of concentrate by industry increased by only 1 per cent.

Last week the Senate requested the Tariff Commission to investigate the differences in the cost of production of U.S.-produced tungsten ore and concentrates and the cost of production of foreign-produced tungsten ore and concentrates. The Commission is to submit its report to the Senate on or before March 1, 1958. A date for public hearings is to be announced.

Presumably nothing further can be done until this investigation has been completed and the report has been submitted, so that in the absence of any substantial revival of demand foreign producers must expect to be hampered by continued uncertainty regarding the long-term policy of their largest customer. They can at least take comfort in the reflection that the high cost of fostering a domestic industry which requires a tariff protection of more than \$30 per unit ton (or the equivalent in subsidies) is unlikely to commend itself to a nation which is becoming increasingly concerned with the twin problems of inflation and rising Government expenditure.

MOLYBDENUM SHORTAGE

A report from New York states that the molybdenum supply situation is becoming critical as a result of a two months' strike at the Langloeth, Pa., plant of the Climax Molybdenum Co., which processes raw material from Colorado. Negotiations are now under way between the company and the United Auto Workers Union. It has been indicated that, should the strike continue much longer, a premium price situation could easily develop, despite the fact that business in tool steel has been rather quiet in recent months. Deliveries outside the U.S. have already felt the impact of the strike. The U.S. produces about 90 per cent of the world's molybdenum and the Climax output represents about 66 per cent of the U.S. production.

PRODUCTION OF INDIUM

In the article on indium which appeared on page 47 of *The Mining Journal Annual Review*, 1957, it was stated that commercial indium was first made on a laboratory scale fifteen years ago at Trail, British Columbia, by the Consolidated Mining and Smelting Co.

We are advised that work on indium actually started as far back as 1924 when Dr. William S. Murray, now president of the Indium Corporation of America, was working with Oneida, Ltd., as director of research.

The principal U.S. producers of indium are the Anaconda Co., of 25 Broadway, New York City, who produce this metal for the Indium Corporation of America. The latter undertaking is the only com-

pany in the U.S. whose sole business is the continued research and development of new uses for indium and the fabrication of the metal into various products. In recent years, the American Smelting and Refining Co. has also been a substantial producer of indium.

GROWING URANIUM SUPPLIES

Exports of "prescribed materials" from the Union of South Africa during the first half of 1957 were valued officially at £22,700,000 compared with £16,500,000 in the corresponding period of last year. It is now estimated that the Union has sufficient uranium oxide to sustain likely production for 61 years, compared with 16 years and 10 years respectively for Canada and the U.S. Under an agreement recently concluded with the U.S., South Africa will have access to stocks of enriched uranium suitable for the requirements of atomic power generation.

The Trade Minister, Mr. Churchill, has declared that Canadian reserves of uranium now appear to be adequate to meet the requirements of all countries likely to buy Canadian uranium in the next few years. All requests by the U.K. for Canadian uranium are being met in full.

Plans to merge five major uranium companies to form the largest independent uranium mining company in the U.S. have been announced. As a result of exchanges of stock, the Hidden Splendour Mining Co. will become a publicly owned corporation having more than 23,000 stockholders, a majority of the outstanding stock being owned by Atlas Corporation. The new company will have combined proved reserves having a value *in situ* of over \$100,000,000.

PHILIPPINE NICKEL DEPOSITS

The huge deposits of nickel ore at Nonoc Island off Surigao in the southern Philippine island of Mindanao were the subject of a recent note (*The Mining Journal*, July 26, 1957, p. 113). Their development has now been ordered by the Philippine President, Sr. Carlos Garcia, who has directed the Bureau of Mines to prepare the necessary groundwork. It is believed that an initial outlay of \$U.S.50,000,000 will be needed to get the industry started.

Sr. Benjamin Gozon, director of the Bureau of Mines, said that a new process to separate nickel and iron from the minor minerals, now in the experimental stage, might soon be perfected. This process would make the development of the Nonoc deposits profitable in the long run. He added that a Bureau of Mines expert was now in the U.S. to study this process. It is believed that, if the methods currently used in exploiting Cuban laterite were applied at Nonoc,

the total investment required to bring the Philippine deposits into production would be at least \$90,000,000. This would involve a treatment plant with a capacity of 5,000 tons daily. Foreign exchange needed for the purchase of plant and equipment is put at the equivalent of about \$60,000,000.

A representative of International Nickel was recently sent to New Guinea, following the discovery there of nickel deposits. Meanwhile, the Bulolo Gold Dredging

Co. Ltd. has applied for a prospecting lease over 10 sq. miles by the Waria River Valley, where nickel deposits were first proved by the Bureau of Mineral Resources. The nickel occurs in a 250-mile belt of country along the Morooc Coast due north of Port Moresby. The deposits as known at present were not regarded as sufficiently extensive to warrant development because of the difficulties of access to the area, but the Administrator of the Territory has declared them to be worth more investigation.

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

The tone of the markets during the last week has been dominated by the weakness in copper and by only moderate trade demand.

LOWER U.S. COPPER PRICES

The fall in the copper price has been less than many people expected owing to bear covering early in the week, but it is now considered that the market is technically vulnerable, as most short positions are probably covered and there is therefore no demand on this score to absorb the daily sales which must remain a feature of the market until consumption improves. The contango continued to widen on a further increase of stocks on Monday to a total of 14,896 l.tons in official warehouses, and general opinion is that the coming weeks will see still

further substantial additions. In America, although some quarters are expressing optimism that the next few weeks will see an upswing in the rate of buying, all producers have this week made appreciable cuts in their prices in hope of stimulating demand. The Customs Smelters price now stands at 26½ c. per lb. with their buying price for No. 2 scrap at approximately 20 c. per lb.; the producers' price now stands at 27 c. and once more some people are saying that this is the absolute minimum price possible, but those with memories know that this has been said on several previous occasions. The only immediate effect of the reductions is that under the price support contracts the United States Government will now have to take into the Stockpile approximately 10,000 tons of metal a month, which may make it easier for other reductions in output to

LONDON METAL AND ORE PRICES, SEPT. 5, 1957

METAL PRICES

Aluminium, 99.5%, £197 per ton

Antimony —

English (99%) delivered, 10 cwt. and over £210 per ton

Crude (70%) £200 per ton

Ore (60%) bases 20s. 0d./21s. 0d. nom. per unit, c.i.f.

Arsenic, £400 per ton

Bismuth (min. 1 ton lots) 16s. lb. nom.

Cadmium 12s. od. lb.

Cerium (99% nett), £13 18s. lb. delivered U.K.

Chromium, Cr. 99% 7s. 2d. lb.

Cobalt, 16s.-19s. lb.

Germanium, 99.99% Ge. kilo lots 3s. 4d. per gram

Gold, 25s. 2d.

Iridium, £27/29 oz. nom.

Lanthanum (98/99%) 15s. per gram

Manganese Metal (96½-98%) £310

Magnesium, 2s. 5d. lb.

Nickel, 99.5% (home trade) £600 per ton

Osmium, £20/22 oz. nom.

Osmiridium, nom.

Palladium, £7 10s./£8 0s. oz.

Platinum U.K. and Empire Refined £31/£34 oz.

Imported £28 10s./£29 10s. nom.

Quicksilver, £85/£87 ex-warehouse

Rhodium, £42 oz.

Ruthenium, £15/£17 oz. nom.

Selenium, 7s. nom. per lb.

Silver, 78½d. f. oz. spot and 78½d. f.d.

Tellurium, 15s. 16s. lb.

ORES AND OXIDES

Bismuth

30% 5s. od. lb. c.i.f.

20% 3s. 3d. lb. c.i.f.

Chrome Ore —

Rhodesian Metallurgical (semifriable) 48%

£19 5s. 0d. per ton c.i.f.

Hard Lumpy (45%)

£19 5s. 0d. per ton c.i.f.

Refractory 40%

£13 0s. 0d. per ton c.i.f.

Small 44%

£18 0s. 0d. per ton c.i.f.

Baluchistan 48%

£12 0s. 0d. per ton f.o.b.

Columbite, 65% combined oxides, high grade

185s./197s. 6d. per unit

Fluorspar —

Acid Grade, Flotated Material

£22 13s. 3d. per ton ex. works

Metallurgical (75/80% Ca F₃)

156s. 0d. ex. works

Lithium Ore —

Petalite min. 31% Li₂O

47s. 6d./52s. 6d. per unit f.o.b. Beira

Lepidolite min. 33% Li₂O

47s. 6d./52s. 6d. per unit f.o.b. Beira

Amblygonite basis 7% Li₂O

£26 5s. per ton f.o.b. Beira

Magnesite, ground calcined

£28 0s./£30 0s. d/d

Magnesite Raw (ground)

£21 0s./£22 0s. d/d

Molybdenite (85% basis)

8s. 5d. nom. per lb. (f.o.b.)

Titanium Ore —

Rutile 95/97% TiO₂ (prompt delivery)

£49/£50 per ton c.i.f. Aust'n

Ilmenite 52/54% TiO₂

£11 10s. per ton c.i.f. Malayan

Wolfram and Scheelite (65%)

112s. 6d./117s. 6d. per unit c.i.f.

Manganese Ore Indian

Europe (46%-48%) basis 130s. freight plus 5% surcharge

131d./133d. per unit c.i.f.

Manganese Ore (43%-45%)

106d./108d. per unit c.i.f.

Manganese Ore (38%-40%)

100d./102d. per unit

(including duty)

Vanadium —

Fused oxide 90-95% V₂O₅)

£12s.-£13s. per unit c.i.f.

Zircon Sand (Australian) (65-66% ZrO₂)

£19 per ton c.i.f.

be made to help decrease production to bring it more into line with consumption. On the Continent, demand other than by pricing on long-term contracts has been negligible and the Belgians have reduced their price to the equivalent of approximately 25½ c. per lb. in two stages during one week.

From Rhodesia it is reported that the African Mine Workers' Union has asked for an all-round increase in basic pay combined with an increase in the copper bonus and revision of African house rents, and some quarters see in this a possibility of further trouble in the Copperbelt in the not too distant future.

TIN STEADY

The tin market has fluctuated within very narrow limits, and in view of the possibility of operations by the Buffer Pool Manager, it is not expected that prices will recede further, although for the time being at least no recovery is looked for. The contango remains small in spite of an additional 43 tons to the stocks in official warehouses on Monday, which now stands at 3,750 l.tons. It is now known that the production of tin-in-concentrates in Malaya for the first seven months of this year amounted to 34,215 l.tons, compared with 36,300 l.tons in the corresponding period of last year. On Thursday morning, the Eastern price was equivalent to £743½ per ton c.i.f. Europe.

SATISFACTORY LEAD AND ZINC DEMAND

The prices for both lead and zinc have tended to recede, but the general opinion is that the fall is more in sympathy with the copper market than for any reason connected with the metals. Demand for both remains satisfactory and any change in sentiment would see an upturn. The question of increased tariffs in America will now probably be referred to the Tariff Commission and this body only has limited powers and the maximum recommendations could be that the duty on lead be raised to 2.55 c. per lb. and that on zinc to 2.10 c. per lb. Production of lead in the O.E.E.C. countries in July amounted to 42,737 tonnes, against 45,640 tonnes in June. It now appears that a considerable contango is unlikely to develop in either metal owing to the contract being on an "ex-ship" basis and the growing tendency for producers to retain stocks at the smelters rather than making shipment to London for financing by the market.

Closing prices and turnovers are:

THE WEEK ON THE L.M.E.

	Aug. 29 Buyers Sellers	Sept. 5 Buyers Sellers
COPPER		
Cash .. .	£201½	£201½
Three months .. .	£204	£204
Settlement .. .	£201½	£198½
Week's turnover .. .	7,525 tons	8,100 tons
LEAD		
Current ½ month .. .	£89½	£90
Three months .. .	£91	£91½
Settlement .. .	2,725 tons	3,800 tons
TIN		
Cash .. .	£735	£735
Three months .. .	£736	£737
Settlement .. .	£735½	£735½
Week's turnover .. .	465 tons	565 tons
ZINC		
Current ½ month .. .	£73½	£73½
Three months .. .	£73½	£72½
Settlement .. .	5,350 tons	4,650 tons

Mining Finance

Beralt Maintains Dividend

In view of the satisfactory profits earned for the twelve months ended March 31, 1957, with the assistance of a favourable long-term contract negotiated in 1952, and having regard to the strong financial position built up in recent years, Beralt Tin and Wolfram are again recommending a final dividend of 100 per cent, making a total of 160 per cent for the year, the same as was paid in the previous year.

However, the board warns shareholders that as a result of the serious fall of over 130s. per unit in the price of wolfram during the past twelve months and the pending expiry of the last of the company's fixed-price contracts on September 30, there must be a substantial decline in future profits until such time as there is a sustained recovery from the current price level.

During the year ended March 31, 1957, the profits of £876,118 represented a fall of £107,129 in the previous year while, after meeting tax charges, net earnings were £100,999 lower at £325,205. The 160 per cent dividend absorbed a net amount of £304,520, the sum of £70,000 was allocated to reserves, leaving the forward balance lower at £204,155 against £253,470 brought in.

The outlook for an upturn in the wolfram price is in the hands of the United States Government, whose policy on this matter is dealt with in a leading note on page 278 in this issue.

RAND AND O.F.S. AUGUST RETURNS

The August returns for the Rand and O.F.S. gold producers were based on a price of 250s. 11d. per oz. This is 7d. more than in July and the highest level reached since October, 1956. The better price was no doubt a helpful factor in raising the general profit level and, in any event, would appear to have offset the outbreak of Asian flu which reached its peak last month.

Stilfontein, the Klerksdorp gold, uranium, and acid producer, justified recent buying with a record return of £426,232, which compares with £403,081 in July and £376,000 in June. Hartebeestfontein advanced its profits to yet another peak, the return showing a profit from gold and uranium of £549,114. Harties has, however, a very long way to go to catch the number one money-earner, West Driefontein, which reported working profits of £612,549 from the crushing of 75,000 tons.

Luipaards Vlei showed working profits of £64,989 against £44,773 in July. The sharp recovery was due to operations on the main reef yielding a profit compared with a loss of over £15,000 in July, when work was hampered by the breakdown of a hoist. The return from Freddie's Consolidated is encouraging with the monthly loss on gold down to £3,997 against £7,027 in July. Losses have been whittled down gradually and the August

figures must give every hope that the September return will put the company in the black for the first time.

In the Anglo American group, Free State Geduld once more raised its working profit, this time to the new high of £301,797, an increase of more than £10,000 on that achieved in the preceding month. Vaal Reefs, an active market counter in recent weeks, raised its mill throughput to 67,000 tons and its profit to £181,391. Loraine showed no change with losses from gold operations remaining at around £5,400.

Other mines worthy of mention are Welkom with profits up to £61,000, President Brand which reported working profits of £427,300, Doornfontein with £198,000 and Harmony, whose profits slipped £8,000 to £181,500.

MORE CAPITAL FOR GEITA

The June quarterly report dealing with operations at Geita Gold Mining and issued by the controlling company, Kentan Gold, foreshadows the need for fresh funds for Geita.

New Consolidated Gold Fields, the consulting engineers, have reported that in order to make it possible for this Tanganyika gold mine to operate on a profit-

able basis in the face of rising costs, it is necessary that further expenditure should be made. Accordingly, arrangements are being made to provide funds by Kentan and by New Consolidated Gold Fields.

At present, Geita's issued capital is £2,669,840 shares of 5s. each, of which 2,099,386 are held by Kentan and 533,968 by Gold Fields. Over a year ago it was announced that new loan facilities of up to £175,000 at 6 per cent were being provided in equal proportions by these two companies. As part of the arrangement, Gold Fields was granted an option on 500,000 Geita shares at par until the end of 1959.

In the June three months Geita declared a working profit of £934 against a loss of £42,127 in the March quarter. Expenditure on capital account and on new reconstruction amounted to £15,833. Operations at the Meru mine ceased in May and the mine closed down.

U-TIN-RIBON VALLEY MERGER OFF

Arrangements to effect an amalgamation between United Tin Areas of Nigeria and Ribon Valley (Nigeria) Tinfields are impracticable under present conditions. This information is given by Mr. A.

LONDON MARKET HIGHLIGHTS

The recovery in Kaffirs that had been making itself felt earlier began to peter out in the week to September 4. The main reason for the easier tendency was the lack of fresh buying support; there was no sign of any selling pressure. On previous occasions, a pause in the impetus of a Kaffir boomlet has been the signal for a wave of bear selling and prices have quickly crumbled. This time, would-be bear operators have been deterred by several factors, including the imminence of the International Monetary Fund meeting and the sharp deterioration in United Kingdom gold and dollar reserves. Although nobody at this stage cares to guess which way the cat will jump, it seems significant that despite the return of gold shares to brokers' lists of recommendations, buying response is small.

Meanwhile, the August monthly returns, which came a day late because of the holiday at Johannesburg, have failed to stimulate any interest. Generally speaking, the returns, though unexceptional, made a good showing. Profits seemed to have been little affected by the wave of Asian flu in South Africa which was reported to have reached its peak last month.

Platinums improved in London following a revival of interest at the Cape after the shares had been quoted ex dividend there. Among Diamonds, De Beers have

fluctuated with Wall Street, while "Casts" have been depressed by events in Sierra Leone and have fallen to 25s. 10½d.

Copper shares have drooped in sympathy with the depressing trend of the metal price, which has slumped to a seven-year low. Losses in share prices have so far been minimized by occasional bear closing and the steady presence of the huge copper group and institutional shareholdings. Even so, share prices must eventually move into line with the full effect of the metal price on profits. A further fall may well be touched off by the Rhodesian Selection Trust June quarterly reports, which are due this week-end.

Tins have tended to be dull as a result of the drying up of Eastern interests during the current Independence celebrations in Malaya. Ayer Hitam have fallen to 30s. 9d. Lead-zincs brightened on the reduction in Australian company tax, but there has been no response in the Golds.

Elsewhere, Ashanti (23s.) made a belated recognition of the good development values disclosed in the August return. London and Rhodesian after being very firm, began to slide and with the shares at 12s. 14d., the view was that the Glazer bid looked like being unsuccessful. Central Provinces Manganese have advanced to 26s. 9d. on the maintained interim dividend.

Hedley Williams, chairman of both companies, in his annual statements wherein he states that while there are definite advantages to be gained by amalgamation, it has been impracticable under present conditions to find an equitable basis as between the two companies on which a scheme could be formulated for presentation to shareholders for their consideration.

Dealing with operations at U-Tin Areas for the nine months ended March 31, 1957, Mr. Williams explains that the loss on operations amounting to £4,070 was largely due to the substantially lower price received on the sale of the company's columbite. The overall position was aggravated further by the fact that rains at Odegi were well below normal and by considerably increased competition for the available labour.

In his statement accompanying the report and accounts of Ribon Valley, Mr. Williams says that because of the difficulty of negotiating long-term contracts for the delivery of a regular tonnage of columbite each month, operations are currently concentrated on the predominantly tin-bearing leases. During the year ended March 31, 1957, profits, before tax, of £10,136 was sufficient to meet tax liabilities of £2,700, pay a dividend of 7½ per cent, and fatten the forward balance to £17,318 compared with £15,681 brought in.

R.S.T. EMPLOYEES' SHARE SCHEME

The Rhodesian Selection Trust group of companies announced in Salisbury, Southern Rhodesia a fortnight ago that since their plan for helping employees to become shareholders in Rhodesian Selection Trust or in Roan Antelope was made known a month ago, 15 per cent of the European employees eligible and 20 per cent of the eligible Africans had become shareholders.

According to an agency message employee shareholders under this scheme so far total 552 Europeans and 99 Africans. This has been considered as a gratifying response and beyond original expectations for the early weeks of the plan.

"ECONOMIC AID" FOR MAZAPIL

The Mazapil Copper Company has announced that an agreement had recently been concluded after long negotiations under which the company would receive "economic aid" in the form of certain refunds of export and production taxes from the Mexican Government.

This aid was applicable in the first place to cover losses on copper mining with any available surplus to be applied against expenditure on the company's expansion programme.

The company added that in view of the strain which the furtherance of this important project would impose on its financial resources, the board regretted that they could not recommend a dividend in respect of 1956. Ten per cent was paid in 1955. The company has announced a net profit of £76,486 against £115,278 in 1955.

ILLEGITIMATE DIAMOND MINERS ATTACK SIERRA LEONE SELECTION TRUST

Consolidated African Selection Trust have announced that the properties at

Yengema, Sierra Leone, held by its subsidiary, Sierra Leone Selection Trust, were attacked by a large number of illicit diamond miners on August 24.

The police available were unable to prevent entry into the company's largest plant which was occupied for twelve hours by rioters and damaged. Strong rooms were raided and stores looted.

Whilst widespread illicit mining is continuing throughout the company's leases and a state of emergency has been declared in the Kono district, police reinforcements have arrived in adequate numbers to protect the property of Sierra Leone Selection Trust and mining operations are now proceeding at all plants.

Uranium Pronto.—The programme which was started last December at Pronto Uranium Mines to increase milling capacity from 1,250 tons a day to 1,500 tons a day was completed in April. May was the first month when production averaged 1,500 tons per day. Ore milled during the quarter ended June 30, totalled 127,630 tons, producing a gross revenue of \$2,814,497. Mine operating costs averaged \$11.54 per ton, while interest payments, Ontario mining tax and head office administration, etc., accounted for an extra \$1.09 per ton during the quarter. By July average mill feed was running at 2.39 lb. per ton, with tails of 0.24 lb. per ton. Net profit for the quarter, after depreciation and pre-production write-offs, was \$705,806.

Tons milled in July were 46,510 tons, while net operating revenue and net profit after depreciation and pre-production write-offs were about the same as the monthly average for the latter part of the previous quarter. Progress during the present quarter continues very satisfactorily. Redemption of \$1,300,000 of the 5 per cent debentures is due by December 1, 1957, for sinking fund purposes and provision is being made for this.

Pronto Uranium is one of the new producers in the Blind River area, Ontario, and is under the control of Rio Tinto Mining of Canada group, in which majority interest is owned by Rio Tinto of London.

Falcon Mines has announced that its shares were officially listed on the Johannesburg Stock Exchange as from August 28.

MILLING ENGINEER, age 31, married, desires position abroad, experienced in open cast mining, and large modern tin ore recovery plant. Reply Box No. 606, The Mining Journal Ltd., 15 Wilson Street, Moorgate, London, E.C.2.

LEAD REFINERY MANAGER Canadian Lead Refinery seeks, for its Battery Lead Blast-Furnace and Lead Refining and Smelting Operation, a thoroughly experienced Works Manager who can take full charge of works in Montreal. Experience in White Metal and Solder desirable. Apply with full details as to age, background, knowledge, and state earliest date of availability to Box No. 607, The Mining Journal, Ltd., 15 Wilson Street, Moorgate, London, E.C.2.

CONCENTRATOR HOUSE SUPERVISOR

required by alluvial mining company in Ghana. Applicants must have had technical experience in an ore-dressing or reduction plant. Basic salary would be in the region of £1,800 per annum plus overseas and marriage allowances totalling £540 per annum, also generous pension, life assurance, medical and provident fund schemes. Twelve months' tours followed by twelve weeks' leave on full salary and allowances, accommodation rent-free and fully furnished. Send full particulars, age, training and experience to W 11, Box No. 608, The Mining Journal, Ltd., 15 Wilson Street, Moorgate, London, E.C.2.

SHIFT BOSSES. Kilembe Mines, Ltd., Uganda, situated at 4,500 ft. altitude in the Ruwenzori Mountains, require experienced underground Shift Bosses for sub-level stoping, cut and fill stoping, also open-cut mining. Contracts of thirty-three months with over-all leave on full pay of 132 days; passage paid both ways. Opportunity for experienced men to gain promotion and permanency in equitable climate in pleasant surroundings. Good social amenities and Retirement Benefit Scheme. Commencing basic salary, £100 per month plus COLA. Apply, giving full particulars of experience, age, size of family and names of at least two previous employers from whom references can be obtained, to Personnel Manager, Kilembe Mines, Ltd., P.O., Kilembe, Uganda.

SENIOR ASSISTANT ENGINEER required by old-established Gold Mining Company in Ghana who will be responsible to the Chief Engineer for the installation, operation and maintenance of all mining equipment comprising Winders (surface and underground), pumps (surface and underground), ventilation fans, compressors, drilling equipment, mechanical loaders, battery and oil engine operated locomotives, skip loading mechanisms, battery charging and sub-station equipment, as used in a highly mechanized metalliferous mine. Minimum qualification, Higher National Certificate. Salary according to qualifications and experience. Permanent employment is offered. Tours of fifteen months' duration followed by three months' leave on full salary. Simply furnished quarters, medical attention, electric light and laundry provided free. Low local income tax rates. Non-contributory pension scheme. Applicants are asked to give in chronological order their technical training, practical experience and positions held in confidence to Box E9087, Whites, 72-78 Fleet Street, London, E.C.4.

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